

What Is Claimed Is:

1. A fuel injector for use with an internal combustion engine, the fuel injector comprising:

a valve group subassembly including:

a tube assembly having a longitudinal axis extending between a first
5 end and a second end, the tube assembly including an inlet tube having an inlet tube face;

a seat secured at the second end of the tube assembly, the seat defining an opening;

an armature assembly disposed within the tube assembly, the
10 armature assembly having a closure member disposed at one end of the armature assembly and an armature portion disposed at the other end of the armature assembly, the armature assembly having an armature face;

a member biasing the armature assembly toward the seat;

a filter assembly disposed within the tube assembly;

15 an adjusting tube disposed within the tube assembly proximate the second end;

a non-magnetic shell extending axially along the axis and coupled at one end of the shell to the inlet tube;

a valve body coupled to the other end of the non-magnetic shell;

20 a lift setting device disposed within the valve body;

a valve seat disposed within the valve body and contiguously engaging the closure member; and

a first attaching portion;

a coil group subassembly including:

25 a housing;

a bobbin disposed partially within the housing, the bobbin having at least one contact portion formed thereon;

30 a solenoid coil operable to displace the armature assembly with
respect to the seat, the solenoid coil being electrically coupled to the at least
one contact portion;
at least one pre-bent terminal being electrically coupled to the at least
one contact portion;
at least one overmold; and
35 a second attaching portion fixedly connected to the first attaching
portion.

2. The fuel injector according to claim 1, wherein the valve group subassembly is axially symmetric about the longitudinal axis.
3. The fuel injector according to claim 1, wherein the filter assembly is disposed at the first end of the inlet tube assembly and includes a retaining portion, the retaining portion operative to retain at least a sealing ring.
4. The fuel injector according to claim 1, wherein the filter assembly is coupled to the adjusting tube.
5. The fuel injector according to claim 4, wherein the filter assembly is conical with respect to the longitudinal axis.
6. The fuel injector according to claim 4, wherein the filter assembly has an inverted cup shape with respect to the longitudinal axis.
7. The fuel injector according to claim 1, wherein the inlet tube includes a tube coupled to a pole piece.
8. The fuel injector according to claim 1, wherein the inlet tube includes a pole piece integrally formed at the second end.

9. The fuel injector according to claim 1, wherein the armature assembly includes an armature tube disposed between the armature portion and the closure member.
10. The fuel injector according to claim 5, wherein the armature tube is non-magnetic.
11. The fuel injector according to claim 5, wherein the armature tube includes at least one elongated aperture disposed on a circumferential surface of the armature tube.
12. The fuel injector according to claim 1, further comprising a lower armature guide disposed proximate the seat, the lower armature guide being adapted to center the armature assembly with respect to the longitudinal axis.
13. The fuel injector according to claim 1, wherein the overmold further including:
a first insulator portion generally surrounding the second end of the inlet tube; and a second insulator portion generally surrounding the first end of the inlet tube, the second insulator portion being bonded to the first insulator portion.
14. The fuel injector according to claim 1, wherein at least one of the armature face and the inlet tube face having a first portion generally oblique to the longitudinal axis.
15. The fuel injector according to claim 14, wherein surface treatments are applied to the first portion.
16. The fuel injector according to claim 14, wherein the first portion is at coated.
17. The fuel injector according to claim 14, wherein the first portion is hardened.
18. The fuel injector according to claim 1, wherein the closure member includes a truncated sphere.

19. The fuel injector according to claim 1, wherein the valve seat is affixed to the valve body.
20. The fuel injector according to claim 1, wherein the valve seat is retained in the valve body via at least a crimped portion of the valve body.
21. The fuel injector according to claim 1, wherein a sealing ring is disposed between at least the valve seat and the crimped portion.
22. The fuel injector according to claim 1, wherein the valve body includes a retainer resiliently coupled to a valve body portion of the valve body, the retainer having a first portion and a second portion.
23. The fuel injector according to claim 22, wherein the retainer includes at least one finger engaging a perimeter of the valve body.
24. The fuel injector according to claim 23, wherein the at least one finger has a locking portion extending radially inward and engaging the valve body.
25. The fuel injector according to claim 23, wherein the valve body portion comprises a groove, the locking portion engaging the groove.
26. The fuel injector according to claim 22, wherein the second portion includes a dimple projecting toward the seat.
27. The fuel injector according to claim 22, wherein the tube assembly further comprises a sealing ring disposed about the tube assembly adjacent the first portion of the retainer.

28. The fuel injector according to claim 27, wherein the retainer retains the sealing ring on the tube assembly.
29. The fuel injector according to claim 1, wherein the lift setting device includes a lift sleeve.
30. The fuel injector according to claim 1, wherein the lift setting device includes a crush ring.
31. The fuel injector according to claim 1, wherein the armature face extends substantially into the perimeter of the solenoid coil.
32. The fuel injector according to claim 1, wherein the thickness of the armature face is less than the thickness of the inlet tube face.
33. A method of assembling a fuel injector, comprising:
providing a valve group subassembly including:
a tube assembly having a longitudinal axis extending between a first
5 end and a second end, the tube assembly including an inlet tube having an inlet tube face;
a seat secured at the second end of the tube assembly, the seat defining an opening;
an armature assembly disposed within the tube assembly, the
10 armature assembly having a closure member disposed at one end of the armature assembly and an armature portion disposed at the other end of the armature assembly, the armature assembly having an armature face;
a member biasing the armature assembly toward the seat;
a filter assembly disposed within the tube assembly;
15 an adjusting tube disposed within the tube assembly proximate the second end;

a non-magnetic shell extending axially along the axis and coupled at one end of the shell to the inlet tube;

a valve body coupled to the other end of the non-magnetic shell;

20 a lift setting device disposed within the valve body;

a valve seat disposed within the valve body and contiguously engaging the closure member; and

a first attaching portion;

providing a coil group subassembly including:

25 a housing;

a bobbin disposed partially within the housing, the bobbin having at least one contact portion formed thereon;

a solenoid coil operable to displace the armature assembly with respect to the seat,

30 the solenoid coil being electrically coupled to the contact terminals ;

at least one pre-bent terminal electrically coupled to the contact portion; and

at least one overmold;

inserting the valve group subassembly into the coil group subassembly;

aligning the valve group subassembly relative to the coil group subassembly on the
35 basis of predetermined reference points on the valve group subassembly and the coil group subassembly; and

affixing the valve group subassembly to the coil group subassembly.